

Appendix C

EFFICIENT TIME-DIVISION MULTIPLEXED ADDRESSING PROTOCOL

FIELD OF THE INVENTION

The present invention generally pertains to wireless networks, and more particularly to methods for polling and otherwise addressing devices in such networks.

BACKGROUND OF THE INVENTION

Computer networks allow multiple computers, peripherals and other information storage, retrieval or processing devices to share data. Each device attached to a network is typically referred to as a node on the network, or a node that is part of the network. Local Area Networks ("LANs") have historically consisted of nodes interconnected by physical telecommunications media (eg, coaxial cable, twisted pair wire, or fiber optics). Recently wireless LANs, the nodes of which are not connected by means of a physical medium, have started to appear in the market. These wireless LANs communicate by means of infra-red (IR), radio or other signals. One of the benefits of using wireless LANs is that cabling is not required. This is a particularly useful feature for mobile nodes such as laptop and notebook computers, PDAs (personal digital assistants), and the like. If appropriately equipped with an appropriate wireless adapter, the mobile nodes can move around within a predefined coverage area and remain connected to the network.

One method of implementing a wireless LAN is similar to a cellular phone network system. In this method wireless mobile nodes do not communicate directly with each other, but rather send all signals to a central base station, which then redirects the signals to the destination node. A similar arrangement is contemplated by the proposed "Bluetooth" wireless communications protocol. This protocol is predicated on the grouping of physically proximate wireless nodes into "piconets", and is described in *Specification of the Bluetooth System*, v0.8, January 22, 1999 (and in subsequent revisions thereof).

In the Bluetooth system each piconet includes a master unit and at least one slave unit. The Bluetooth protocol specifies a time-division duplex communication scheme in which each slave unit is polled by the master unit immediately prior to transmitting information. Once polled, the addressed slave unit transmits during the next time slot. Since each time slot is specified to be 625 microseconds in length, no members of the piconet other than the

1 master unit and the addressed slave unit are able to transmit during the 1,250 microsecond
2 duration of this exchange. The Bluetooth protocol currently allows for only 7 active slave
3 units within a given piconet, and thus each slave unit is given the opportunity to transmit
4 information every 14 slots (i.e., every 14*625 microseconds). Since a single slot may contain
5 up to 18 user data bytes, each slave unit may transmit at up to 16kb/second. Unfortunately, if
6 a given slave unit requires less than this amount of bandwidth, the difference is wasted unless
7 additional slave units are "parked" and "unparked" pursuant to the Bluetooth protocol.
8 However, a significant amount of overhead is associated with this "parking" mechanism, and
9 its use may result in potentially long idle periods preceding transmission from newly
10 "unparked" slave units.

11 Accordingly, it would be desirable to provide a technique for enabling relatively larger
12 number of slave units to simultaneously participate in Bluetooth and other networks in the
13 absence of the shortcomings discussed above.

14 15 SUMMARY OF THE INVENTION

16 Briefly, therefore, this invention provides for a method and apparatus for
17 communicating within a system including a master unit and one or more slave units. A
18 member address, corresponding to a selected time slot of a plurality of time slots defined by a
19 system clock configured to repeat in cycles, is assigned to a first slave unit. The first slave
20 unit is also assigned a first extended address associated with an occurrence of the designated
21 time slot within at least a selected one of the cycles. After being polled by the master unit
22 during an immediately preceding time slot, the first slave unit transmits information thereto
23 during the designated selected time slot within the selected cycle.

24
25 2. The method of claim 1 further including the step of assigning to a second slave unit
26 said member address and a second extended address associated with a different occurrence of
27 said selected time slot within one or more of said cycles, said second slave unit being
28 disposed to transmit information during said different occurrence of said selected time slot.

29 30 31 BRIEF DESCRIPTION OF THE DRAWINGS

32 In the accompanying drawings:

FIG. 1 illustrates a plurality of wireless nodes configured within a first and second piconets in accordance with the present invention.

FIG. 2 is a block diagram illustratively representing the components of a wireless node and associated software configured in accordance with a preferred embodiment of the present invention.

FIG. 3 is a flow chart representation of the procedures followed in connection with the transmission of internet management broadcasts by wireless nodes configured as master nodes, and the transmission of advertisements by wireless nodes functioning as slave nodes.

FIG. 4 illustrates an alternately preferred embodiment of the present invention in which first and second piconets each include nodes coupled to the PSTN.

FIG. 5 is an illustrative representation of another alternately preferred embodiment of the present invention containing first and second piconets, each of which include a node coupled to a telephone link via a gateway unit.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is more fully described with reference to FIGS. 1 - 5. An exemplary implementation of the invention is discussed and illustrated with reference to its implementation using wireless networks predicated on the proposed "Bluetooth" wireless communications protocol. This protocol contemplates the grouping of physically proximate wireless nodes into "piconets", and is described in *Specification of the Bluetooth System*, v0.8, January 22, 1999 (and in subsequent revisions thereof). It should be understood that this invention is not limited to such a wireless protocol, and could be similarly implemented using other types of wireless networks.

FIG. 1 illustrates a plurality of wireless nodes included within a first piconet 10 and a second piconet 20. The first piconet 10 is comprised of a master node M1, and of slave nodes S1, S2, S4, S6 and S7. The second piconet 20 contains a master node M2, and slave nodes S3, S4 and S5. For purposes of illustration, it is assumed that certain of the wireless nodes depicted in FIG. 1 are mobile relative to one another. In the piconet architecture of FIG. 1, each slave node within the first piconet 10 is within the coverage area of master node M1 and each slave node within the second piconet 20 is within the coverage area of master node M2. However, slave nodes within the first and second piconets 10 and 20 need not be within transmission range of other slave nodes within their respective networks.

1 As is discussed below, slave node S4 is a member of both the first and second piconets
2 10 and 20, and facilitates internetworking therebetween. In this regard internetworking refers
3 to the communication between the first and second piconets 10 and 20 facilitated by the
4 distributed network management system of the present invention. The slave node S4, or
5 “internetworking node”, understands the protocols of both the first and second piconets 10
6 and 20, and is capable of transparently relaying data traffic therebetween.

7 Because the wireless nodes within the piconets 10 and 20 are not necessarily within
8 transmission range of all the other wireless nodes within the same piconet, each wireless node
9 may not be able to monitor all of the network traffic within its piconet. For example, slave
10 node S2 may be able to “listen” to slave node S1 but may not be able to monitor transmissions
11 from slave node S7. In a preferred implementation each slave node transmits an
12 advertisement identifying its address and the services it offers. Each such advertisement also
13 incorporates the address of all other slave nodes from which advertisements are received by
14 the slave node transmitting a given advertisement. Based on this information, the master node
15 of a piconet can determine all nodes participating in the piconet and the service offered by
16 each. As used herein the term “services” encompasses, without limitation, the capability of a
17 given slave node to relay message information to and from one or more outside networks.
18 Accordingly, the advertisement issued by each slave node may also identify the other
19 networks within which the slave node is capable of communication and the services offered
20 by each.

21 Based upon the advertisements received from each slave node, the master node of the
22 piconet issues an “internet management broadcast” identifying: (i) the nodes participating in
23 the piconet, (ii) the services offered by each, and (iii) the services offered by each external
24 network accessible to one or more slave nodes of the piconet. In a preferred implementation
25 each slave node capable of communication with an external network will only advertise such
26 capability to the extent it is willing to serve as a conduit for data or message information
27 directed to such network. As an example, consider the case in which internetworking node S4
28 elects to transmit advertisements within the first piconet 10 describing the services available
29 within the second piconet 20. In this case internetworking node S4 need not necessarily issue
30 reciprocal advertisements within piconet 20; that is, advertisements identifying the services
31 available within piconet 10. Based upon this advertisement from internetworking node S4,
32 slave node S7 may decide to transmit a message to slave node S3 (via master node M1,

1 internetworking node S4, and master node M2). In the preferred implementation
2 internetworking node S4 will also forward (via master node M1) any message response sent
3 by slave node S3 to slave node S7.

4 In both of the piconets 10 and 20, a small portion of the available spectrum is allocated
5 to the advertisements issued by each slave node and to the internet management broadcasts
6 made by the applicable master node. When a wireless node desires to participate in this
7 internet management protocol, it initially ascertains whether any other wireless node is
8 currently making internet management broadcasts. If an existing internet management
9 broadcast or advertisement is not detected, the wireless node begins periodic transmission of
10 an initial advertisement identifying its address, the services it offers, as well as a handle (i.e.,
11 name) for the piconet being formed. The initial advertisement also specifies the operating
12 mode of the initially participating node and the manner in which it may be contacted by other
13 nodes desiring to participate (i.e., the node may only check for reply transmissions at certain
14 times). Another wireless node receiving the initial advertisement and desiring to participate
15 in the piconet will transmit an acknowledgement message notifying the initial wireless node
16 of its identity and the services it offers. Again, the services offered by the newly participating
17 wireless node include its own inherent capabilities, as well as the capabilities of any devices
18 within networks accessible to the newly participating device.

19 Once the initially participating node has discerned the presence of any newly
20 participating node through receipt of the acknowledgement message, these two nodes will
21 preferably negotiate to determine which should assume the role of periodically issuing the
22 internet management broadcast for the piconet. That is, the two nodes will preferably decide
23 which will become the master node for the piconet and which will become a slave node. In
24 one approach, each node is classified into one of a set of predefined operating modes by
25 considering the node's mobility, power resources, and other parameters bearing upon its
26 suitability to periodically transmit the internet management broadcast. For example, a
27 desktop PC and a handheld wireless device would likely not share the same operating mode in
28 view of their differences in mobility and power resources. In a preferred implementation, the
29 node currently functioning as the master node will compare its operating mode to that of the
30 node from which it receives an advertisement. Should the node issuing the advertisement be
31 of an operating mode deemed to be preferable to the operating mode of the current master
32 node, the current master node relinquishes its status as master node by sending one last internet

1 management broadcast. This last broadcast identifies the address of the new master node, and
2 instructs the new master node to assume the role of periodically issuing internet management
3 broadcasts.

4 Any wireless node participating in a piconet is free to revoke or modify its
5 advertisement. For example, to the extent internetworking node S4 (FIG. 1) had initially
6 identified its affiliation with the second piconet 20 in its advertisement issued for the first
7 piconet 10, it could omit reference to this affiliation in subsequent advertisements. A wireless
8 node will preferably omit such references to affiliations with other networks from its
9 advertisements to other networks when it determines it would be unable to support additional
10 connections to such network on behalf of requesting devices. For example, if internetworking
11 node S4 only possessed capacity to support connections to the second piconet 20 for three
12 devices within the first piconet 10, it will preferably omit its affiliation with the second
13 piconet 20 in its advertisement for the first piconet 10 upon establishing three such
14 internetworking paths.

15 A wireless node will generally revoke its advertisement upon recognizing that it is
16 likely to imminently move out of range of the master node for the piconet. In addition, such a
17 node will attempt to notify any devices for which it is currently serving as a "gateway" to an
18 external network of its imminent departure from the piconet. For example, if internetworking
19 node S4 were to determine it would soon move out of range of master node M1 and was
20 currently supporting a connection to the second piconet 20 (e.g., to node S5) for node S6, it
21 would attempt to notify node S6 of its imminent departure from the first piconet 10.
22 Unfortunately, such notification on the part of a device departing from a piconet is not always
23 possible. An abrupt departure from a piconet could occur when a device comprising one of
24 the piconet's wireless nodes is abruptly turned off, or when such a device moves to a location
25 from which communication with the piconet's master node is precluded due to an intervening
26 obstruction. When a node (e.g., node S6) abruptly loses communication with an external
27 network due to the abrupt departure from the piconet of a gateway node (e.g., internetworking
28 node S4), it notifies the applicable master node (e.g., node M1). This master node then
29 implicitly revokes the advertisement for the gateway node, and suggests utilization of an
30 alternate gateway node (if available) for the previously served node (i.e., node S6).

31 It is also of course possible that the current master node for a piconet could move out
32 of range of one or more slave nodes, or could become precluded from continuing internet

1 management broadcasts due to a loss of power or other device failure. If a slave node does
2 not receive an internet management broadcast when expected, the slave node will preferably
3 attempt to contact the master node to determine if it is currently operational. If such contact is
4 not made and the slave node fails to detect advertisements from any other wireless nodes, the
5 slave node itself assumes the role of master node and commences issuing internet
6 management broadcasts. If the slave node detects other advertisements, it negotiates with the
7 wireless node issuing such advertisements in order to determine which of the two should
8 become the new master node. Upon detecting an internet management broadcast from a new
9 master node, all devices electing to participate as slave nodes provide their existing
10 advertisements to the new master node in order that its database may be established.

11 When a current master node becomes incapable of continuing internet management
12 broadcasts (e.g., upon moving out of range or experiencing a device failure), it is possible that
13 collisions may occur among the initial internet management broadcasts issued by the slave
14 devices remaining within the piconet. In a preferred implementation only certain of the
15 participating slave nodes are configured to issue an initial internet management broadcast
16 subsequent to departure of the previous master node from the piconet. Alternatively or in
17 addition, any remaining slave nodes designated to begin internet management broadcasts are
18 each permitted to do so only after expiration of a random interval.

19 FIG. 2 is a block diagram illustratively representing the components of a wireless node
20 100 and associated software configured in accordance with a preferred embodiment of the
21 present invention. In a preferred implementation each wireless node 100 is capable of being
22 configured for operation as either a master node or a slave node. Accordingly, unless
23 otherwise indicated the following discussion should be considered applicable to both master
24 and slave nodes. Referring to FIG. 2, the wireless node 100 may be in the form of an
25 electronic device (e.g., a laptop or desktop computer, hand-held electronic organizer, or
26 printer) containing a first wireless adapter card 104 and a first RF transceiver 106 disposed for
27 communication in accordance with a first network communication standard. The wireless
28 node 100 may also optionally include a second wireless adapter card 108 and a second RF
29 transceiver 110 for communicating in accordance with a second network communication
30 standard. The second wireless adapter card 108 and the second RF transceiver 110 may be
31 included within the wireless node 100 when, for example, it is anticipated that the wireless
32 node may participate in piconets operative in accordance with different network standards.

1 For example, internetworking node S4 would preferably be configured with different wireless
2 transceivers and associated adapter cards to the extent the first piconet 10 and second piconet
3 20 were governed by differing network communication standards. The wireless node 100
4 may also include a LAN adapter card 112 for facilitating communication with a wired LAN,
5 or alternately a wireline modem for effecting communication through the PSTN.

6 Each wireless adapter card and transceiver is controlled by a CPU 114 operative to
7 execute program instructions of the various software routines 122 stored in memory 126.
8 Within slave nodes, a network resources table 130 is updated in response to internet
9 management broadcasts by the master node of the applicable piconet. The network resources
10 table 130 stores the network address and services offered by each wireless node within the
11 piconet. In the case of internetworking nodes, these advertised services may include the
12 services provided by a wireless node from a neighboring piconet in communication with the
13 internetworking node. Within master nodes, the network resources table 130 is constructed
14 by a network resources updating routine 134 on the basis of advertisements received from
15 participating slave nodes within the applicable piconet.

16 Included among the software routines 122 within internetworking nodes is a
17 forwarding routine 138 for forwarding messages to the wired LAN via the LAN adapter card
18 112, or to another wireless node via one of the wireless transceivers 106, 110 and associated
19 wireless adapter card 104, 108. An advertisement generating routine 140 operates to generate
20 the advertisements issued by the wireless node 100 which specify its network address and
21 services offered. In connection with the entry of the wireless node 100 into a given piconet, a
22 master/slave registration routine 142 functions to negotiate with other nodes of the piconet as
23 to whether the wireless node 100 will assume the role of master or slave.

24 FIG. 3 is a flow chart representation of the procedures followed in connection with the
25 transmission of: (i) internet management broadcasts by wireless nodes configured as master
26 nodes, and (ii) advertisements by wireless nodes functioning as slave nodes. In step 170, a
27 wireless node desiring to register within a piconet initially listens for the presence of
28 advertisements or internet management broadcasts issued by wireless nodes associated with
29 the piconet. If neither an internet management broadcast nor an advertisement is detected
30 (steps 174 and 178), the wireless node issues an advertisement in order to initiate
31 establishment of a piconet in the manner described above (step 180). Additional internet
32 management broadcasts separated by network-dependent idle intervals (step 182) are then

1 issued by the wireless node (step 184). If an internet management broadcast is not detected
2 but an advertisement is detected (steps 174 and 178), the wireless node negotiates with any
3 slave nodes issuing advertisements in order to institute the master/slave hierarchical
4 arrangement described above (step 186). If as a result of this negotiation the wireless node is
5 accorded status as a master node (step 188), it begins transmission of internet management
6 broadcasts at network-dependent intervals (steps 182 and 184).

7 If it is determined that the wireless node is not to be a master node (step 188) or if
8 internet management broadcasts are not detected (step 174), the wireless node generates an
9 advertisement as a slave node (step 190). The wireless node then transmits advertisements
10 (step 192) separated by network-dependent idle intervals (step 194), each such advertisement
11 reflecting the network address of the wireless node and an array of services currently being
12 offered.

13 Tables I and II below illustratively represent simplified network resources tables 130
14 respectively compiled by master nodes M1 and M2 in the context of an exemplary
15 implementation of the network topology of FIG. 1. Specifically, in this exemplary
16 implementation it is assumed a modem ("Modem1") is attached at node S1, a general use
17 printer ("GP Printer") is attached at node S2, and a second modem ("Modem2") is attached at
18 node S3. In addition, a printer ("S6 Printer") restricted for use by node S6 is attached at node
19 S5.

20 Once all nodes become participating, the advertisements issued by each will reflect
21 attachment of the applicable device. For example, node S2 will advertise capabilities of GP
22 Printer and node S5 will advertise capabilities of S6 Printer. Upon accumulation of this
23 information, the network resources table 130 compiled by node M1 will include the following
24 entries:

25 Table I

26 Modem1 via S1 direct
27 Modem2 via S4 relay
28 GP Printer via S2 direct
29 S6 Printer via S4 relay.

30 Similarly, the network resources table 130 of node M2 will contain the following entries:

31 Table II

32 Modem 1 via S4 relay
33 Modem 2 via S3 direct
34 GP Printer via S4 relay

1 S6 Printer via S5 direct.

2 In the case where Modem1 is substantially identical to Modem2, the internet management
3 broadcast of master node M1 will preferably only contain information pertinent to Modem1
4 and the broadcast of node M2 will only include information relating to Modem2. Under this
5 condition, the internet management broadcast from node M1 will include:

6 Modem 1 via S1 direct
7 GP Printer via S2 direct
8 S6 Printer via S4 relay,

9 while the internet management broadcast from node M2 will contain:

10 Modem 2 via S3 direct
11 GP Printer via S4 relay
12 S6 Printer via S5 direct.

13 As is indicated by the foregoing, node S6 can roam between the first and second piconets 10
14 and 20 and still be capable of printing at its "private" printer (i.e., S6 Printer).

15 FIG. 4 illustrates an alternately preferred embodiment of the present invention in
16 which a plurality of wireless nodes form a first piconet 220 and a second piconet 224. The
17 first piconet 220 is comprised of a master node M1' and slave nodes S1', S2', S6' and S7'.
18 The second piconet 224 contains a master node M2' and slave nodes S3', S4' and S5'. Again,
19 it is assumed that certain of the wireless nodes depicted in FIG. 4 may be mobile relative to
20 one another. In the piconet architecture of FIG. 4, each slave node within the first piconet 220
21 is within the coverage area of master node M1' and each slave node within the second piconet
22 224 is within the coverage area of master node M2'. However, slave nodes within the first
23 and second piconets 220 and 224 need not be within transmission range of other slave nodes
24 within their respective networks.

25 Although the first and second piconets 220 and 224 do not share a common
26 internetworking node, slave nodes S4' and S7' are linked by the PSTN. As was discussed
27 above, internetworking node S4' may report on the availability of services within the first
28 piconet 220 in its advertisement to master node M2'. Similarly, slave node S7' may report on
29 the availability of services within the second piconet 224 in its advertisement to master node
30 M1'. Accordingly, subject to the bandwidth constraints of slave nodes S4' and S7', the
31 services offered by nodes within the second piconet 224 may be made available to nodes
32 within the first piconet 220, and vice-versa.

1 FIG. 5 is an illustrative representation of another alternately preferred embodiment of
2 the present invention containing a first piconet 250 and a second piconet 260. The first and
3 second piconets 250 and 260 each include a set of potentially mobile wireless nodes
4 physically separated by a wall or similar rigid structure 270. Referring to FIG. 5, the first
5 piconet 250 is comprised of a master node M1'' and slave nodes S1'', S2'', S6'' and S7''. The
6 second piconet 260 contains a master node M2'' and slave nodes S3'', S4'' and S5''. In the
7 piconet architecture of FIG. 5 each slave node within the first piconet 250 is within the
8 coverage area of master node M1'' and each slave node within the second piconet 260 is
9 within the coverage area of master node M2''.

10 Although the first and second piconets 250 and 260 do not share a common
11 internetworking node, communication may be established between slave nodes S4'' and S1''
12 via first and second gateway units 270 and 272 and telephone line 276. In particular, the first
13 gateway unit 270 is operative to convert over-the-air signals transmitted by internetworking
14 node S4'' in a predefined format (e.g., Bluetooth) into signals capable of being transported by
15 telephone line 276 to gateway unit 272. Similarly, the second gateway unit 272 is operative
16 to convert over-the-air signals transmitted by slave node S1'' in a predefined format into RF
17 signals for transport by telephone line 276 to gateway unit 270. The gateway units 270 and
18 272 also convert the RF signals from the telephone line 276 into over-the-air signals for
19 transmission to slave nodes S1'' and S4'', respectively. In a preferred implementation the first
20 and second gateway units 270 and 272 each include a PhoneNet adapter card or the like for
21 conducting signals to and from the telephone line 276.

22 Although the above application has been described primarily with reference to specific
23 embodiments, one skilled in the art can readily appreciate that the teachings of the present
24 invention may be applied in other communication contexts. Thus the application is meant
25 only to be limited by the scope of the appended claims.

1 What is claimed is:

2 1. A method for communicating within a system including a master unit and one or more
3 slave units, said method comprising the steps of:

4 assigning a member address to a first slave unit, said member address corresponding
5 to a selected time slot of a plurality of time slots defined by a system clock, said time slots
6 repeating in cycles;

7 assigning to said first slave unit a first extended address associated with an occurrence
8 of said selected time slot within at least a selected one of said cycles; and

9 transmitting information from said first slave unit to said master unit during said
10 occurrence of said selected time slot.

11
12 2. The method of claim 1 further including the step of assigning to a second slave unit
13 said member address and a second extended address associated with a different occurrence of
14 said selected time slot within one or more of said cycles, said second slave unit being
15 disposed to transmit information during said different occurrence of said selected time slot.

16
17 3. The method of claim 2 further including the step of determining whether less than a
18 maximum permitted number of said slave units have been assigned to said member address,
19 said maximum permitted number of slave units being determined by performing a division
20 operation in which a bandwidth associated with said member address is divided by a
21 bandwidth allocated to said first slave unit, said maximum permitted number of slave units
22 being no greater than a quotient of said division operation.

23
24 4. The method of claim 1 further including the step of polling said first slave unit during
25 one of said plurality of time slots immediately preceding said occurrence of said selected time
26 slot.

27
28 5. The method of claim 4 further including the step of polling said second slave unit
29 during one of said plurality of time slots immediately preceding said different occurrence of
30 said selected time slot.

1 6. The method of claim 1 further including the step of synchronizing said master unit,
2 said first slave unit and said second slave unit to said system clock, said first extended address
3 and said second extended address corresponding to first and second states of said system
4 clock.

5
6 7. The method of claim 1 wherein said step of assigning a member address includes the
7 step of determining whether a bandwidth associated with extended addresses corresponding to
8 said member address is no less than a desired bandwidth of said first slave unit.

9
10 8. The method of claim 1 further including the step of assigning a second member
11 address to a second slave unit, said second member address corresponding to a different
12 selected time slot of said plurality of time slots, said second slave being disposed to transmit
13 information during each occurrence of said different selected time slot.

14
15 9. The method of claim 8 further including the step of assigning, to a third slave unit,
16 said first member address and a second extended address associated with a different
17 occurrence of said selected time slot within one or more of said cycles, said third slave unit
18 being disposed to transmit information during said different occurrence of said selected time
19 slot.

20
21 10. The method of claim 8 further including the step of polling said first slave unit during
22 one of said plurality of time slots immediately preceding said occurrence of said selected time
23 slot, and polling said second slave unit during the one of said plurality of time slots
24 immediately preceding said different selected time slot.

25
26 11. A communication system in which a sequence of time slots repeats in cycles, said
27 communication system comprising:

28 a first slave unit; and

29 a master unit, said master unit including:

30 means for assigning a member address to said first slave unit, said member
31 address corresponding to a selected one of said sequence of time slots;

1 means for assigning to said first slave unit a first extended address associated
2 with an occurrence of said selected one of said sequence of time slots within one or
3 more of said cycles, said first slave unit being disposed to transmit information during
4 said occurrence of said selected one of said sequence of time slots.

5
6 12. The communication system of claim 11 further including a second slave unit; said
7 master unit including means for assigning to said second slave unit said member address and a
8 second extended address associated with a different occurrence of said selected one of said
9 sequence of time slots within one or more of said cycles, said second slave unit being
10 disposed to transmit information during said different occurrence of said selected one of said
11 sequence of time slots.

12
13 13. The communication system of claim 11 further including a second slave unit, said
14 master unit including means for assigning a second member address to said second slave unit,
15 said second member address corresponding to a different selected time slot of said sequence
16 of time slots, said second slave unit being disposed to transmit information during each
17 occurrence of said different selected time slot.

18
19 14. In a communication system in which a master unit communicates with one or more
20 slave units during a sequence of time slots repeating in cycles, said master unit comprising:

21 means for polling a first slave unit;
22 means for assigning a member address to said first slave unit, said member address
23 corresponding to a selected one of said sequence of time slots; and
24 means for assigning to said first slave unit a first extended address associated with an
25 occurrence of said selected one of said sequence of time slots within one or more of said
26 cycles, said first slave unit being disposed to transmit information during said occurrence of
27 said selected one of said sequence of time slots.

28
29 15. The master unit of claim 14 further including means for assigning to a second slave
30 unit said member address and a second extended address associated with a different
31 occurrence of said selected one of said sequence of time slots within one or more of said

1 cycles wherein said second slave unit is disposed to transmit information during each
2 occurrence of said selected one of said sequence of time slots

3
4 16. The master unit of claim 14 further including means for assigning a second member
5 address to a second slave unit, said second member address corresponding to a different
6 selected time slot of said sequence of time slots wherein said second slave unit is disposed to
7 transmit information during each occurrence of said different selected time slot.

ABSTRACT OF THE DISCLOSURE

A

Relevant sections of Bluetooth spec as appendix

165365 v1/SD
3JLH01!.DOC
102303/1301